XIX. *The life-history of* Geometra smaragdaria.

By George Elisha.

[Read October 6th, 1886.]

The eggs of *Geometra smaragdaria* are laid in July, on the stems and leaves of *Artemisia maritima*, generally near the top of the shoots. When first laid they are of a light yellowish colour, changing in about a fortnight to dark greyish, soon after which the young larvæ emerge, and immediately cover themselves with minute portions of their food-plant, which they attach to their bodies, with some glutinous secretion, so firmly that it is very difficult to remove them. It seems a matter of great importance to these larvæ that they should so cover themselves; for a few eggs laid by a female which I had temporarily placed in a chip-box, being firmly attached to the side of the box, were left there until they hatched, when the young larvæ, having no *Artemisia* to operate upon, appropriated the loose splinters and other small particles that were inside the box, and attached them to their bodies, giving themselves a most singular appearance when viewed under a lens, not unlike that of miniature porcupines. On putting them into a glass jar with some *Artemisia* they very soon changed their costume, and, on looking at them a few hours afterwards, I found them covered with fragments of their food-plant, as in their natural state.

The larvæ during the whole of their existence keep the body in an arched position, except when feeding when they stretch themselves out a little; but on the slightest alarm they again assume the curved position, with the anal claspers fixed to the plant, and the prolegs drawn up close to their bodies. They feed rather slowly, and for about three weeks after emerging from the egg appear like little balls of white wool, from being covered with the mealy portions of the *Artemisia*. As the larva increases in size it increases the length of the morsels

of the food-plant it attaches to its body, which on some adult larvæ are often three-quarters of an inch in length. When the pieces are first attached to the body they are, of course, green and fresh, but they soon become discoloured, and in a few days are withered and brown; then the larvæ, in their curved position, so exactly resemble the dead shoots of their food-plant that they are extremely difficult to detect, unless some movement betrays them, or one is familiar with their peculiar appearance. Thus it is evident that the object of the larvæ in attaching these pieces to their bodies is for the purpose of protection against their numerous enemies.

The larvæ continue feeding till about the end of October, by which time they have attained the length of one-half to three-quarters of an inch, after which they fix themselves to the food-plant, and remain motionless during the winter months. With the first warm days of spring, towards the end of February, they begin moving; and about the first week of March, when the *Artemisia* is again appearing above the ground, they commence feeding, soon after which they moult and again cover themselves with pieces of the food-plant, which, being now green and fresh, give them a healthy appearance. About the middle of June they are full-grown, when they rest for a day or two, and then spin a loose network cocoon; (this they form by drawing together, with silken threads, the pieces of the *Artemisia* that are thickly adhering to their bodies, into an oval-shaped covering attached to the stem of the food-plant), and in it they change to a greyish pupa, with the striped wing-cases showing very distinctly.

The larva, when full-fed, is about an inch and a quarter long, of a dirty greyish colour, with darker lines along the body, the skin very rough, and the head and legs brown; but, owing to its being covered so entirely with the dead and brown portions of the food-plant, it is extremely difficult to make out the exact markings. It sometimes feeds at dusk, but more frequently during the morning sunshine, and at times, when the sun is hot, it eats most voraciously, appearing in a very excited state during the whole time the sun is shining upon it. This necessity for sunshine constitutes one of the many difficulties the collector has to contend with in rearing these larvæ, for the sun is, of course, a great obstacle to keeping

the food fresh. The only way to keep the food comparatively fresh is to dig up the *Artemisia* with a large clod of earth, so as not to disturb the roots, and even then it rarely keeps longer than a week. To be successful therefore with these larvæ a great deal of trouble must be undergone.

The perfect insects appear about the middle of July, generally during the early morning, and remain motionless the whole of the first day; and I believe until daybreak of the next, for I have looked at them as late as twelve o'clock at night, and found them still motionless; but, on again looking at them about seven o'clock on the following morning, some had paired, remaining *in copulâ* during the whole of that day, but parting towards the evening. By the following morning the females had commenced depositing ova, and continued to do so for four or five days, each laying about 150 eggs altogether, and some more.

It seems singular that this insect should have remained such an apparent rarity for so many years past; but no doubt the habits of the perfect insect are the cause. It seldom moves unless disturbed, and then will generally drop to the ground and remain motionless; but after pairing the male becomes more active, and will fly about if touched, when of course it soon gets damaged. In the natural state I have no doubt it keeps concealed among the *Artemisia*, and so escapes observation.

The larva was first found by Mr. Machin, quite accidentally, a few years back, and he kept the secret of its food-plant; but two years ago I had the pleasure of taking the larva myself, again quite by accident, and recorded its discovery in the 'Entomologist' (vol. xvii., p. 235). As stated in that note, I did not then know what the larva fed on; and through my ignorance of the food-plant made many fruitless journeys to the Essex coast in search of it. One day, while taking some cases of *Coleophoræ* off the *Artemisia*, I noticed what was apparently a withered shoot move; it then stretched itself out with a tremulous motion, and I at once saw it was a larva of some kind, and, being so much like *bajularia*, I concluded it must be the species I had so many times looked for, viz., *smaragdaria*. My surmise proved correct, and I have since been able to find the larva at many places on the

Essex coast, over an extent of ground at least thirty miles in length. It will, in my opinion, be found anywhere along this coast, where its food-plant is growing; and will thus afford another instance of, what is apparently, a great rarity becoming a comparatively common species as soon as its food-plant and the habits of the larva are known.